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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/675,778	09/29/2000	Lars Langemyr	CMM-00101	8229
26339	7590	01/25/2006	EXAMINER	
MUIRHEAD AND SATURNELLI, LLC 200 FRIBERG PARKWAY, SUITE 1001 WESTBOROUGH, MA 01581			SHARON, AYAL I	
			ART UNIT	PAPER NUMBER
			2123	

DATE MAILED: 01/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/675,778

Applicant(s)

LANGEMYR ET AL.

Examiner

Ayal I. Sharon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-101 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-101 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 September 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Introduction

1. Claims 1-101 of U.S. Application 09/675,778, originally filed on 09/29/2000, are currently pending. The application claims priority to provisional application 60/222,394, filed 8/2/2000. In the amendment filed on 11/28/2005, Applicants have amended the scope of independent claims 1, 42, 82, and 92.

Drawings

2. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. The following rejections are based on Annex IV of the "Interim Guidelines for Examination of Patent Applications for Subject Matter Eligibility" (hereinafter "Interim Guidelines"), effective Oct. 26, 2005, and posted on the USPTO official website at the following URL:

<http://www.uspto.gov/web/offices/pac/dapp/ogsheet.html>

5. **Claims 1-101 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.** An invention which is eligible for patenting under 35 U.S.C. § 101 is in the “useful arts” when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The fundamental test for patent eligibility is thus to determine whether the claimed invention produces a **“useful, concrete and tangible result.”** According to p.4 of the Interim Guidelines,

The claimed invention as a whole must be useful and accomplish a practical application. That is, it must produce a “useful, concrete and tangible result.” State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of “real world” value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research (Brenner v. Manson, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96 (1966)); In re Fisher, 421 F.3d 1365, 76 USPQ2d 1225 (Fed. Cir. 2005); In re Ziegler, 992 F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993)).

The test for practical application as applied by the examiner involves the determination of the following factors:

- a. **“Useful”** - The Supreme Court in Diamond v. Diehr requires that the examiner look at the claimed invention as a whole and compare any asserted utility with the claimed invention to determine whether the asserted utility is accomplished. Applying utility case law the examiner will note that:
 3. the utility need not be expressly recited in the claims, rather it may be inferred.

4. if the utility is not asserted in the written description, then it must be well established.
 - b. **"Tangible"** - Applying In re Warmerdam, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994), the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and method of making it. If so, the claim involves no more than a manipulation of an abstract idea and therefore, is nonstatutory under 35 U.S.C. § 101. In Warmerdam the abstract idea of a data structure became capable of producing a useful result when it was fixed in a tangible medium which enabled its functionality to be realized. See MPEP §2106 (A). See also Schrader, 22 F.3d at 295, 30 USPQ2d at 1459.
 - c. **"Concrete"** - Another consideration is whether the invention produces a "concrete" result. Usually, this question arises when a result cannot be assured. An appropriate rejection under 35 U.S.C. § 101 should be accompanied by a lack of enablement rejection, because the invention cannot operate as intended without undue experimentation.
 - d. Claims 1-101 do not produce a tangible result.
6. **Claims 1-101 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.** All claims are directed to functional descriptive material. According to p.50 of the Interim Guidelines,

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer

component. (The definition of “data structure” is “a physical or logical relationship among data elements, designed to support specific data manipulation functions.” The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) “Nonfunctional descriptive material” includes but is not limited to music, literary works and a compilation or mere arrangement of data.

Both types of “descriptive material” are nonstatutory when claimed as descriptive material per se. Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759. When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

Claims 42-81 and 92-101 recite a “computer program product”, but this term could also refer to, for example, a file downloaded from the internet, and therefore does not correspond to “computer readable medium.” In addition, p.53 of the Interim Guidelines states the following:

Similarly, computer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical “things.” They are neither computer components nor statutory processes, as they are not “acts” being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program’s functionality to be realized. In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program’s functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035. Accordingly, it is important to distinguish claims that define descriptive material per se from claims that define statutory inventions.

Claims 1-41 and 82-91 appear to be directed to computer programs per se, and therefore are non-statutory

7. **Claims 1, 3-41, and 82-91 are rejected under 35 U.S.C. 101 because the disclosed invention is inoperative and therefore lacks utility.** Dependent claim 2, which depends from independent claim 1, claims "[t]he method of claim 1, wherein forming said combined system is performed by machine executable code in said computer system." Assuming that claim 2 further limits claim 1, then claim 1 and its dependent claims 3-41 do not necessarily form the combined system of differential equations by machine executable code in the computer system. Examiner finds that claims 1 and 3-41 are inoperable without this limitation. Examiner also finds that this rejection also applies to claims 82-91.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. **Claims 1-101 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly

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connected, to make and/or use the invention. Independent claims 1, 42, 82, and 92 have been amended to claim the “representation of a partial differential equation system” for “two or more selected application modes.” However, the amendment did not provide support for this feature in the original specification, and the Examiner has not been able to locate such support in the specification.

- 11. Claims 1-41 and 82-91 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.** Independent claims 1 and 82 use the word “system” in the term “computer system” and “partial differential equation system”. Examiner finds the term “system” to be ambiguous, and suggests replacing the currently-used terms. Terms such as “computer apparatus” and “set of partial differential equations would be preferable.

Claim Rejections - 35 USC § 102

- 12.** The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

- 13.** The prior art used for these rejections is as follows:

- 14.** FEMLAB 1.0 Reference Manual. First Printing, July 1998. (Henceforth referred to as “**FEMLAB Reference Manual**”).

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15. FEMLAB 1.0 User's Guide and Introduction. First Printing, July 1998. (Henceforth referred to as "**FEMLAB User's Manual**").

16. FEMLAB 1.0 Model Library. First Printing, July 1998. (Henceforth referred to as "**FEMLAB Model Library**").

17. FEMLAB 1.0 Structural Mechanics Engineering Module. First Printing, July 1998. (Henceforth referred to as "**FEMLAB Structural Mechanics Module**").

18. The four cited documents constituted the official documentation set that was shipped with the FEMLAB 1.0 product. The Preface of the FEMLAB User's Manual (p.1-2) states that:

The documentation bundle in the FEMLAB package consists of the following volumes:

- User's Guide and Introduction (this volume)
- Reference Manual
- Model Library

And the optional add-on module is delivered with this volume:

- Structural Mechanics Engineering Module

Moreover, the top three volumes share the same index. All pages with a 1- prefix (e.g. p.1-1, p.1-29) are in the User's Guide. All pages with a 2- prefix (e.g. p.2-1, p.2-29) are in the Model Library. All pages with a 3-, 4-, or 5- prefix (e.g. p.3-1, p.4-29) are in the Reference Manual.

The Examiner is therefore treating the first three references as three volumes of the same document, which Examiner is calling "FEMLAB 1.0 product documentation."

19. Examiner also wishes to note that several of the figures in the instant application appear to be screen shots taken from the FEMLAB manuals. For example, Item 526 in Fig. 30 contains the text "FEMLAB Application Example." In addition, Figure 4 in the application is similar to the top figure on p.1-40 of the FEMLAB User's Guide. (The application figure has two additional parameters and a checkbox for "Active in this Domain" that are not present in the FEMLAB User's Guide figure).

20. Examiner also notes that one of the co-inventors in the application, Mr. Lars Langemyr, is also cited in the FEMLAB User's Guide (p.1-3) as "VP of Development" for the FEMLAB product.

21. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

22. Claims 1-33, 35-36, 39-73, and 75-101 are rejected under 35 U.S.C. 102(b) as being anticipated by FEMLAB 1.0 product documentation.

23. In regards to the limitations of claim 1, FEMLAB 1.0 product documentation teaches the following limitations:

1. A method executed in a computer system for producing a combined system of partial differential equations comprising:
representing each of a plurality of systems as two or more selected application modes modeling physical quantities of said each system;
(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, pp.1-6 and 1-7 teach that "When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the 'New' tab and choose the application mode that you want to work in. To load a completed model you click on the 'Model Library' tab and choose a model from one of the application areas."

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determining a representation of a partial differential equation system for each two or more selected application modes corresponding to one of said plurality of systems; and

(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, p.1-57 teaches that "In PDE mode, you can interactively specify application-dependent material parameters in the Physics mode or the PDE coefficients in the PDE modes. You can specify the values for each subdomain independently. This makes it easy to specify, e.g., various material properties in a FEMLAB model."

forming said combined system of partial differential equations using partial differential equation systems associated with said plurality of systems.

(FEMLAB User's Guide: pp.1-6, 1-7, 1-85 to 1-90, 1-117, and FEMLAB Reference Manual: pp.3-21 to 3-38.)

From the formulas shown in pages 1-85 to 1-90, examiner interprets "PDE" as corresponding to "Partial Differential Equations".

24. In regards to the limitations of claim 2, FEMLAB 1.0 product documentation

teaches the following limitations:

2. The method of Claim 1, wherein said forming said combined system is performed by machine executable code in said computer system.

(FEMLAB User's Guide, especially: Front Cover)

The front cover of the FEMLAB User's Guide teaches that FEMLAB is "For use with: MATLAB V5, Windows 95, Windows NT, UNIX." Windows 95, Windows NT, and UNIX are all computer operating systems. MATLAB V5 is a computer software application. It is inherent that FEMLAB is performed by machine executable code in a computer system.

25. In regards to the limitations of claim 3, FEMLAB 1.0 product documentation

teaches the following limitations:

3. The method of Claim 1, further comprising:

representing at least one of said physical quantities of a first of said plurality of application modes using at least one dependent variable in said partial differential equation system corresponding to first application mode.

(FEMLAB User's Guide, especially: pp.1-39 to 1-40, top figure)

The dialog box shown on the top figure of p.1-40 shows user definitions for six dependent variables in an equation. Page 1-39 of the same reference identifies the dialog box as belonging to the “PDE Mode”.

26. In regards to the limitations of claim 4, FEMLAB 1.0 product documentation teaches the following limitations:

4. The method of Claim 3, further comprising:
representing said at least one of said physical quantities directly as said at least one dependent variable.
(FEMLAB User’s Guide, especially: pp.1-39 to 1-40, top figure)

The dialog box shown on the top figure of p.1-40 shows user definitions for six dependent variables in an equation. Two of them are “Density” and “External Temperature”, which are physical quantities.

27. In regards to the limitations of claim 5, FEMLAB 1.0 product documentation teaches the following limitations:

5. The method of Claim 4, further comprising:
representing said at least one of said physical quantities using a relation between said at least one dependent variable and another variable representing said at least one physical quantity.
(FEMLAB User’s Guide, especially: pp.1-39 to 1-40, top figure)

The dialog box shown on the top figure of p.1-40 shows user definitions for six dependent variables in an equation. Among the relations between the variables are ‘+’, ‘-’, and ‘p’ (a gradient).

28. In regards to the limitations of claim 6, FEMLAB 1.0 product documentation teaches the following limitations:

6. The method of Claim 5, wherein said at least one of said physical quantities is represented using at least one of: a numerical value and a mathematical expression.
(FEMLAB User’s Guide, especially: pp.1-39 to 1-40, top figure)

The dialog box shown on the top figure of p.1-40 shows user definitions for six dependent variables in an equation. Among the relations between the variables are ‘+’, ‘-’, and ‘p’ (a gradient).

29. In regards to the limitations of claim 7, FEMLAB 1.0 product documentation teaches the following limitations:

7. The method of Claim 6, further comprising:
forming said mathematical expression including at least one of: a space coordinate, a time coordinate, a numerical value, and an actual physical quantity.
(FEMLAB User's Guide, especially: pp.1-39 to 1-40, top figure)

The dialog box shown on the top figure of p.1-40 shows user definitions for six dependent variables in an equation. Two of them are "Density" and "External Temperature", which are physical quantities.

30. In regards to the limitations of claim 8, FEMLAB 1.0 product documentation teaches the following limitations:

8. The method of Claim 1, further comprising:
associating at least one subdomain with each application mode.
(FEMLAB User's Guide, especially: p.1-71)

Page 1-71 teaches that "When using the union operation, internal borders will partition the resulting solid into subdomains ... if you do not want borders to be created – deselect the checkbox 'Keep internal borders' in the 'Create Composite Object' dialog box."

31. In regards to the limitations of claim 9, FEMLAB 1.0 product documentation teaches the following limitations:

9. The method of Claim 8, wherein each of said physical quantity is described by at least one physical property, and the method further comprising:
disabling at least one physical quantity and associated variables in a subdomain.
(FEMLAB User's Guide, especially: p.1-71)

Page 1-71 teaches that "When using the union operation, internal borders will partition the resulting solid into subdomains ... if you do not want borders to be created – deselect the checkbox 'Keep internal borders' in the 'Create Composite Object' dialog box."

32. In regards to the limitations of claim 10, FEMLAB 1.0 product documentation

teaches the following limitations:

10. The method of Claim 1, further comprising:

displaying a partial differential equation in one of a: coefficient view and a general form corresponding to a representation of said partial differential equation; and

(FEMLAB User's Guide, especially: pp.1-7 to 1-8)

modifying a portion of said partial differential equation.

(FEMLAB User's Guide, especially: pp.1-7 to 1-8, and p.1-85)

The last paragraph of p.1-7 teaches that "As already mentioned, the basic mathematical structure that FEMLAB is founded upon, is a system of partial differential equations (PDEs). The PDEs can be represented in the *coefficient form* or the *general form*."

The first paragraph of p.1-8 teaches that: "The coefficient form is suitable for linear or almost linear problems, while the general form is intended for nonlinear problems."

The figure on p.1-85 is described on p.1-85 as follows: "In the GUI, the following dialog box is opened in the PDE-mode for a coefficient form, scalar, and stationary problem."

33. In regards to the limitations of claim 11, FEMLAB 1.0 product documentation

teaches the following limitations:

11. The method of Claim 10, further comprising: modifying at least one boundary condition of said partial differential equation.

(FEMLAB User's Guide, especially: p.1-86)

The figure on p.1-86 is described as follows: "The boundary conditions are given in the following dialog box that is opened in boundary mode ... The default values correspond to homogeneous Dirichlet boundary conditions, but you can easily choose other possibilities. By selecting one boundary at a time in the Boundary selection field you may impose different boundary conditions on different segments of the boundary."

34. In regards to the limitations of claim 12, FEMLAB 1.0 product documentation

teaches the following limitations:

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12. The method of Claim 10, further comprising:
modifying at least one coefficient of said partial differential equation.
(FEMLAB User's Guide, especially: p.1-87)

The figure on p.1-87 is described as follows: "The default values of the coefficients correspond to Poisson's equation, but you can fill in your own expression. The expressions can be constants or depend on x, y, z, and the components of \mathbf{p} ."

35. In regards to the limitations of claim 13, FEMLAB 1.0 product documentation teaches the following limitations:

13. The method of Claim 10, further comprising:
obtaining data using a graphical user interface in connection with said plurality of systems.
(FEMLAB User's Guide, especially: Figures on p.1-85, p.1-86, p.1-87)

36. In regards to the limitations of claim 14, FEMLAB 1.0 product documentation teaches the following limitations:

14. The method of Claim 10, further comprising:
using a graphical user interface to display and input data.
(FEMLAB User's Guide, especially: Figures on p.1-85, p.1-86, p.1-87)

37. In regards to the limitations of claim 15, FEMLAB 1.0 product documentation teaches the following limitations:

15. The method of Claim 1, further comprising:
solving said combined system of partial differential equations using a coefficient form of said combined system of partial differential equations.
(FEMLAB User's Guide, especially: pp.1-7 to 1-8, and p.1-85)

The last paragraph of p.1-7 teaches that "As already mentioned, the basic mathematical structure that FEMLAB is founded upon, is a system of partial differential equations (PDEs). The PDEs can be represented in the *coefficient form* or the *general form*."

The first paragraph of p.1-8 teaches that: "The coefficient form is suitable for linear or almost linear problems, while the general form is intended for nonlinear problems."

The figure on p.1-85 is described on p.1-85 as follows: “In the GUI, the following dialog box is opened in the PDE-mode for a coefficient form, scalar, and stationary problem.”

38. In regards to the limitations of claim 16, FEMLAB 1.0 product documentation teaches the following limitations:

16. The method of Claim 1, further comprising:
solving said combined system of partial differential equations using a general form of said combined system of partial differential equations
(FEMLAB User’s Guide, especially: p.1-87)

The figure on p.1-87 is described as follows: “For the general form, the following dialog box is opened ... The default values of the coefficients correspond to Poisson’s equation, but you can fill in your own expression. The expressions can be constants or depend on x, y, z, and the components of pu.”

39. In regards to the limitations of claim 17, FEMLAB 1.0 product documentation teaches the following limitations:

17. The method of Claim 16, further comprising:
converting at least one partial differential equation system included in said combined system of partial differential equations from coefficient to general form.
(FEMLAB Reference Manual, especially: pp.3-21 to 3-27)

The FEMLAB Reference Manual teaches on p.3-21 that “The coefficient format is most suited for linear or almost linear PDEs.”

The FEMLAB Reference Manual teaches on p.3-24 that “The general form is most suited for nonlinear PDEs.”

The FEMLAB Reference Manual teaches on p.3-26 that “Solving a strongly nonlinear equation is an iterative process and at every step the procedure is to compute the residual of the current guess (a measure of how far away you are from satisfying the equation) and then to improve the guess by reducing the residual. It turns out that the Jacobian of the residual in general form are [sic] can be obtained from the coefficient form, see the section “The Nonlinear Solver” on page 3-60. Thus, an efficient tool for solving linear equations in coefficient form is the key to fast iterations for strongly nonlinear problems.”

40. In regards to the limitations of claim 18, FEMLAB 1.0 product documentation

teaches the following limitations:

18. The method of Claim 17, further comprising:
converting said combined system of partial differential equations from coefficient to general form.

(FEMLAB Reference Manual, especially: pp.3-21 to 3-27)

The FEMLAB Reference Manual teaches on p.3-21 that “The coefficient format is most suited for linear or almost linear PDEs.”

The FEMLAB Reference Manual teaches on p.3-24 that “The general form is most suited for nonlinear PDEs.”

The FEMLAB Reference Manual teaches on p.3-26 that “Solving a strongly nonlinear equation is an iterative process and at every step the procedure is to compute the residual of the current guess (a measure of how far away you are from satisfying the equation) and then to improve the guess by reducing the residual. It turns out that the Jacobian of the residual in general form are [sic] can be obtained from the coefficient form, see the section “The Nonlinear Solver” on page 3-60. Thus, an efficient tool for solving linear equations in coefficient form is the key to fast iterations for strongly nonlinear problems.”

41. In regards to the limitations of claim 19, FEMLAB 1.0 product documentation

teaches the following limitations:

19. The method of Claim 18, further comprising: using linearization of a general form to solve for a non-linear system of partial differential equations.

(FEMLAB Reference Manual, especially: pp.3-21 to 3-27)

The FEMLAB Reference Manual teaches on p.3-21 that “The coefficient format is most suited for linear or almost linear PDEs.”

The FEMLAB Reference Manual teaches on p.3-24 that “The general form is most suited for nonlinear PDEs.”

The FEMLAB Reference Manual teaches on p.3-26 that “Solving a strongly nonlinear equation is an iterative process and at every step the procedure is to compute the residual of the current guess (a measure of how far away you are from satisfying the equation) and then to improve the guess by

reducing the residual. It turns out that the Jacobian of the residual in general form are [sic] can be obtained from the coefficient form, see the section "The Nonlinear Solver" on page 3-60. Thus, an efficient tool for solving linear equations in coefficient form is the key to fast iterations for strongly nonlinear problems."

42. In regards to the limitations of claim 20, FEMLAB 1.0 product documentation

teaches the following limitations:

20. The method of Claim 19, further comprising:
using a Newton method in solving for said non-linear system of partial differential equations.

(FEMLAB User's Guide, especially: p.1-95)

The FEMLAB User's Guide teaches on p.1-95 that "Iterative methods can be used to solve the nonlinear equation. FEMLAB provides a nonlinear solver using a damped Newton method.

43. In regards to the limitations of claim 21, FEMLAB 1.0 product documentation

teaches the following limitations:

21. The method of Claim 1, further comprising:
solving said combined system of partial differential equations.

(FEMLAB User's Guide, especially: pp.1-54, 1-58)

The FEMLAB User's Guide teaches on p.1-54 that "Solve menu: from the Solve menu, you can start and control the computation of the model. You can also open dialog boxes where you can specify initial conditions and specify the solver parameters. You can import solutions from the workspace."

The FEMLAB User's Guide teaches on p.1-58 that "In solve mode, you can set initial conditions that are used for dynamic problems and by the nonlinear solver. It is possible to set varying initial values on different subdomains. Using the Solver parameters dialog box, you can invoke and control the properties of the various solvers."

44. In regards to the limitations of claim 22, FEMLAB 1.0 product documentation

teaches the following limitations:

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22. The method of Claim 21, wherein solving said combined system further includes:

selecting a portion of physical quantities in said combined system of partial differential equations;

(FEMLAB User's Guide, especially: pp.1-54, 1-58)

solving for one or more variables associated with said portion of physical quantities.

(FEMLAB User's Guide, especially: pp.1-54, 1-58)

The FEMLAB User's Guide teaches on p.1-54 that "Solve menu: from the Solve menu, you can start and control the computation of the model. You can also open dialog boxes where you can specify initial conditions and specify the solver parameters. You can import solutions from the workspace."

The FEMLAB User's Guide teaches on p.1-58 that "In solve mode, you can set initial conditions that are used for dynamic problems and by the nonlinear solver. It is possible to set varying initial values on different subdomains. Using the Solver parameters dialog box, you can invoke and control the properties of the various solvers."

45. In regards to the limitations of claim 23, FEMLAB 1.0 product documentation

teaches the following limitations:

23. The method of Claim 22, further comprising:

using values associated with physical quantities not included in said portion for specifying initial conditions.

(FEMLAB User's Guide, especially: pp.1-54, 1-58)

The FEMLAB User's Guide teaches on p.1-54 that "Solve menu: from the Solve menu, you can start and control the computation of the model. You can also open dialog boxes where you can specify initial conditions and specify the solver parameters. You can import solutions from the workspace."

The FEMLAB User's Guide teaches on p.1-58 that "In solve mode, you can set initial conditions that are used for dynamic problems and by the nonlinear solver. It is possible to set varying initial values on different subdomains. Using the Solver parameters dialog box, you can invoke and control the properties of the various solvers."

46. In regards to the limitations of claim 24, FEMLAB 1.0 product documentation

teaches the following limitations:

24. The method of Claim 21, further comprising:
selecting a solver type specifying a particular technique used in solving said
combined system of partial differential equations.

(FEMLAB Reference Manual, especially: pp.4-44 to p.4-55)

**The figure on p.4-46, and the accompanying text on p.4-47 teach that
“FEMLAB offers four different ways of handling constraints” and that there
are three ways of performing the Jacobian approximation method.**

47. In regards to the limitations of claim 25, FEMLAB 1.0 product documentation

teaches the following limitations:

25. The method of Claim 24, wherein said solver type uses a finite element
method.

(FEMLAB Reference Manual, especially: pp.4-44 to p.4-55)

**The figure on p.4-54, and the accompanying text on pp.4-54 to 4-55 teach a
“Multigrid” method which uses meshes and grid matrices. This inherently
is a finite element method (See p.3-49 to 3-50 for a description of “The
Finite Element Mesh”).**

48. In regards to the limitations of claim 26, FEMLAB 1.0 product documentation

teaches the following limitations:

26. The method of Claim 1, further comprising:
using a graphical user interface in connection with input data;

(FEMLAB Reference Manual, especially: pp.4-36 to 4-39)

storing said input data in a representation in a data structure stored in a memory
of the computer system; and

(FEMLAB Reference Manual, especially: pp.4-36 to 4-39)

converting said input data into an intermediate form wherein said
intermediate form for each system of partial differential equations associated with
said plurality of systems is used in forming said combined system.

(FEMLAB Reference Manual, especially: pp.4-36 to 4-39)

On p.4-37, FEMLAB Reference Manual teaches that “In the coefficient scalar application mode you can also enter the name of a user-defined MATLAB function that computes the coefficient value. For details on the syntax of a *PDE Coefficient M-file*, see the entry on ‘assemble’ in the *Function Reference* chapter.

Examiner interprets that the name of the MATLAB function is the input data, and the calculated coefficient value is the converted intermediate form of the data.

49. In regards to the limitations of claim 27, FEMLAB 1.0 product documentation teaches the following limitations:

27. The method of Claim 1, further comprising:

determining a submode setting associated with one of the partial differential equation systems associated with said plurality of systems; and
(FEMLAB User’s Guide, especially: pp.1-7 to 1-8, and p.1-85)

determining a number of variables included in said one partial differential equation system in accordance with said submode setting and a type of a corresponding application mode.
(FEMLAB User’s Guide, especially: pp.1-7 to 1-8, and pp.1-85 to 1-87)

The last paragraph of p.1-7 teaches that “As already mentioned, the basic mathematical structure that FEMLAB is founded upon, is a system of partial differential equations (PDEs). The PDEs can be represented in the *coefficient form* or the *general form*.

The first paragraph of p.1-8 teaches that: “The coefficient form is suitable for linear or almost linear problems, while the general form is intended for nonlinear problems.”

The figure on p.1-85 is described on p.1-85 as follows: “In the GUI, the following dialog box is opened in the PDE-mode for a coefficient form, scalar, and stationary problem.”

Examiner interprets the form (coefficient or general) corresponds to the claimed “submode setting”.

Examiner interprets that the dialog boxes shown on pp.1-85 to 1-87 determine the number of variables included in the PDE system in accordance with the submode setting and type of application mode.

50. In regards to the limitations of claim 28, FEMLAB 1.0 product documentation teaches the following limitations:

28. The method of Claim 27, wherein said submode is one of stationary, time dependent, linear, non-linear, scalar and multi-component.
(FEMLAB User's Guide, especially: pp.1-7 to 1-8, and pp.1-85 to 1-87)

The last paragraph of p.1-7 teaches that "As already mentioned, the basic mathematical structure that FEMLAB is founded upon, is a system of partial differential equations (PDEs). The PDEs can be represented in the *coefficient form* or the *general form*."

The first paragraph of p.1-8 teaches that: "The coefficient form is suitable for linear or almost linear problems, while the general form is intended for nonlinear problems."

The figure on p.1-85 is described on p.1-85 as follows: "In the GUI, the following dialog box is opened in the PDE-mode for a coefficient form, scalar, and stationary problem."

Examiner interprets the form (coefficient or general) corresponds to the claimed "submode setting".

51. In regards to the limitations of claim 29, FEMLAB 1.0 product documentation teaches the following limitations:

29. The method of Claim 1, further comprising: selecting at least one application mode.
(FEMLAB Reference Manual, especially: p.3-98, and pp.4-73 to 4-74)

FEMLAB Reference Manual teaches on p.3-98 that "The *application mode section* determines the application modes. ... When a model M-file has been loaded into the GUI, the settings made in this section determines the contents of the *Specify boundary conditions* dialog and the *PDE Specification* dialog box when *Coefficient View* has not been enabled."

FEMLAB Reference Manual teaches on p.4-73 a list of "the available application modes."

52. In regards to the limitations of claim 30, FEMLAB 1.0 product documentation

teaches the following limitations:

30. The method of Claim 29, wherein said at least one application mode is one of predefined and user defined.

(FEMLAB Reference Manual, especially: p.3-98, and pp.4-73 to 4-74)

(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

FEMLAB User's Guide teaches on pp.1-6 and 1-7 that "When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the 'New' tab and choose the application mode that you want to work in. To load a completed model you click on the 'Model Library' tab and choose a model from one of the application areas." The figure on p.1-6 also shows modes that are available.

FEMLAB Reference Manual teaches on p.4-73 a list of "the available application modes."

53. In regards to the limitations of claim 31, FEMLAB 1.0 product documentation

teaches the following limitations:

31. The method of Claim 30, further comprising:

modifying a set of routines associated with a predefined application mode to be used in connection with a user defined application mode.

(FEMLAB User's Guide, especially: p.1-6, p.1-49)

FEMLAB User's Guide teaches on p.1-49 that "You can build your own models that you can access from the 'User Models' page in the 'Model Navigator'." The figure on p.1-49 also shows the 'User Models' tab in the 'Model Navigator' dialog box.

FEMLAB User's Guide also teaches on p.1-6 that "The 'Model Navigator' is a tabbed dialog box with four pages. You can see the four tabs at the top of the dialog box. To start creating a new model you click on the 'New' tab and choose the application mode that you want to work in. To load a completed model you click on the 'Model Library' tab and choose a model from one of the application areas.

Therefore, Examiner interprets that FEMLAB teaches that both a) a user can modify a set of routines associated with a predefined application mode ('New' tab), and b) a user can define a new application mode ('User Models' tab).

54. In regards to the limitations of claim 32, FEMLAB 1.0 product documentation

teaches the following limitations:

32. The method of Claim 1, wherein one of said plurality systems being modeled is a one-dimensional geometry model.

(FEMLAB User's Guide, especially: p.1-2)

(FEMLAB Reference Manual, especially: pp.3-13 to 3-17)

FEMLAB User's Guide teaches on p.1-2 that "FEMLAB is capable of addressing a broader class of problems, including the more general 2D geometrical problems."

FEMLAB Reference Manual pp.3-13 to 3-17 teaches 1-D and 2-D geometrical objects.

55. In regards to the limitations of claim 33, FEMLAB 1.0 product documentation

teaches the following limitations:

33. The method of Claim 1, wherein one of said plurality systems being modeled is a two-dimensional geometry model.

(FEMLAB User's Guide, especially: p.1-2)

(FEMLAB Reference Manual, especially: pp.3-13 to 3-17)

FEMLAB User's Guide teaches on p.1-2 that "FEMLAB is capable of addressing a broader class of problems, including the more general 2D geometrical problems."

FEMLAB Reference Manual pp.3-13 to 3-17 teaches 1-D and 2-D geometrical objects.

56. In regards to the limitations of claim 35, FEMLAB 1.0 product documentation

teaches the following limitations:

35. The method of Claim 31, further comprising:
defining a user-defined application mode.

(FEMLAB User's Guide, especially: p.1-6, p.1-49)

FEMLAB User's Guide teaches on p.1-49 that "You can build your own models that you can access from the 'User Models' page in the 'Model

Navigator’.” The figure on p.1-49 also shows the ‘User Models’ tab in the ‘Model Navigator’ dialog box.

FEMLAB User’s Guide also teaches on p.1-6 that “The ‘Model Navigator’ is a tabbed dialog box with four pages. You can see the four tabs at the top of the dialog box. To start creating a new model you click on the ‘New’ tab and choose the application mode that you want to work in. To load a completed model you click on the ‘Model Library’ tab and choose a model from one of the application areas.

Therefore, Examiner interprets that FEMLAB teaches that both a) a user can modify a set of routines associated with a predefined application mode (‘New’ tab), and b) a user can define a new application mode (‘User Models’ tab).

57. In regards to the limitations of claim 36, FEMLAB 1.0 product documentation teaches the following limitations:

36. The method of Claim 35, wherein said defining a user-defined application mode further comprises:

defining an object class corresponding to said user-defined application mode; and

(FEMLAB Reference Manual, especially: p.3-16 to p.3-17)

defining a first portion of methods included in said object class using functionality that is inherited from other classes.

(FEMLAB Reference Manual, especially: p.3-16 to p.3-17)

FEMLAB Reference Manual teaches on p.3-16 a “hierarchical inheritance structure of the 2-D geometry classes”, and on p.3-17, a “hierarchical inheritance structure of the 1-D geometry classes.

58. In regards to the limitations of claim 39, FEMLAB 1.0 product documentation teaches the following limitations:

39. The method of Claim 31, further comprising:

defining an application that is a subclass of an existing class corresponding to functionality of an application mode.

(FEMLAB User’s Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, pp.1-6 and 1-7 teach that “When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the ‘New’ tab and choose the application mode that you want to work in. To load a completed model you click on the ‘Model Library’ tab and choose a model from one of the application areas.”

For example, p.1-57 teaches that “In PDE mode, you can interactively specify application-dependent material parameters in the Physics mode or the PDE coefficients in the PDE modes. You can specify the values for each subdomain independently. This makes it easy to specify, e.g., various material properties in a FEMLAB model.”

59. In regards to the limitations of claim 40, FEMLAB 1.0 product documentation teaches the following limitations:

40. The method of Claim 39, wherein said application mode is user-defined. (FEMLAB User’s Guide, especially: p.1-6, p.1-49)

FEMLAB User’s Guide teaches on p.1-49 that “You can build your own models that you can access from the ‘User Models’ page in the ‘Model Navigator’.” The figure on p.1-49 also shows the ‘User Models’ tab in the ‘Model Navigator’ dialog box.

Therefore, Examiner interprets that FEMLAB teaches that a user can define a new application mode (‘User Models’ tab).

60. In regards to the limitations of claim 41, FEMLAB 1.0 product documentation teaches the following limitations:

41. The method of Claim 39, wherein said application mode is predefined. (FEMLAB User’s Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, pp.1-6 and 1-7 teach that “When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the ‘New’ tab and choose the application mode that you want to work in. To load a completed model you click on the ‘Model Library’ tab and choose a model from one of the application areas.”

For example, p.1-57 teaches that “In PDE mode, you can interactively specify application-dependent material parameters in the Physics mode or the PDE coefficients in the PDE modes. You can specify the values for each

subdomain independently. This makes it easy to specify, e.g., various material properties in a FEMLAB model.”

Therefore, Examiner interprets that FEMLAB teaches that both a) a user can modify a set of routines associated with a predefined application mode (‘New’ tab).

- 61. Claims 42-73 are rejected based on the same reasoning as claims 1 and 3-33 supra. Claims 42-73 are computer program product claims reciting the equivalent limitations as are recited in method claims 1 and 3-33 and taught throughout FEMLAB 1.0 product documentation.**
- 62. Claims 75-76 and 79-81 are rejected based on the same reasoning as claims 35-36 and 39-41 supra. Claims 75-76 and 79-81 are computer program product claims reciting the equivalent limitations as are recited in method claims 35-36 and 39-41, but without the limitations of the intervening claims 29-31 (or the equivalent claims 69-71). Therefore claims 75-76 and 79-81 are broader than the rejected claims 35-36 and 79-41, which were taught throughout FEMLAB 1.0 product documentation.**
- 63. In regards to the limitations of claim 82, FEMLAB 1.0 product documentation teaches the following limitations:**

82. A method executed in a computer system for solving a system of partial differential equations comprising:
defining a plurality of user-defined application modes modeling physical quantities of an associated model; and
(FEMLAB User’s Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, pp.1-6 and 1-7 teach that “When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the ‘New’ tab and choose the application mode that you want to work in. To load a completed model you click on the ‘Model Library’ tab and choose a model from one of the application areas.”

selecting two or more selected application modes
(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

See for example, pp.1-6 and 1-7 in regards to PDEs.

determining a representation of said partial differential equation system for said selected two or more user defined application modes of said associated model.

(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, p.1-57 teaches that "In PDE mode, you can interactively specify application-dependent material parameters in the Physics mode or the PDE coefficients in the PDE modes. You can specify the values for each subdomain independently. This makes it easy to specify, e.g., various material properties in a FEMLAB model."

64. In regards to the limitations of claim 83, FEMLAB 1.0 product documentation

teaches the following limitations:

83. The method of Claim 82, further comprising:
solving for said partial differential equation system using a finite element method.
(FEMLAB User's Guide, for example: pp.1-91 to 1-95)

For example, p.1-91 teaches that:

"When solving PDEs by numerical methods, a geometrical domain is described first. The domain is then discretized by generating a mesh on it. The PDE is in turn discretized on the mesh. In the end, a set of algebraic equations can be built for the discrete approximation of the solution. The FEMLAB GUI provides you with graphical tools to describe complicated domains and automatically generate triangular meshes. It also discretizes the PDEs, finds discrete solutions and plots the results.

This section is an overview of the Finite Element Method (FEM) in 2-D."

65. In regards to the limitations of claim 84, FEMLAB 1.0 product documentation

teaches the following limitations:

84. The method of Claim 82, wherein said user-defined application mode is one of: a one-dimensional model, a two-dimensional model and a three-dimensional model.

(FEMLAB User's Guide, for example: pp.1-91 to 1-95)

For example, p.1-91 teaches that:

"When solving PDEs by numerical methods, a geometrical domain is described first. The domain is then discretized by generating a mesh on it. The PDE is in turn discretized on the mesh. In the end, a set of algebraic equations can be built for the discrete approximation of the solution. The FEMLAB GUI provides you with graphical tools to describe complicated domains and automatically generate triangular meshes. It also discretizes the PDEs, finds discrete solutions and plots the results.

This section is an overview of the Finite Element Method (FEM) in 2-D."

66. In regards to the limitations of claim 85, FEMLAB 1.0 product documentation teaches the following limitations:

85. The method of Claim 84, wherein said defining a user-defined application mode further comprises:

defining an object class corresponding to said user-defined application mode; and

(FEMLAB User's Guide, for example: pp.1-49 to 1-52)

defining a first portion of methods included in said object class using functionality that is inherited from other classes.

(FEMLAB User's Guide, for example: pp.1-49 to 1-52)

(FEMLAB Reference Manual, especially: p.3-16 to p.3-17)

For example, the last paragraph of User's Guide p.1-50 teaches that:

"The Model Library is important for several reasons: it offers a quick way to learn the facilities of FEMLAB and you can examine the results of completed models. You can also save time by using models from the Model Library as an initial platform for developing your own models. You can modify the geometry, the values of variables, boundary conditions, etc."

The figure on p.1-50 also demonstrates this."

67. In regards to the limitations of claim 86, FEMLAB 1.0 product documentation teaches the following limitations:

86. The method of Claim 85, further comprising:

overloading a second portion of methods to provide alternative functionality.
(FEMLAB User's Guide, for example: pp.1-49 to 1-52)

For example, the last paragraph of p.1-50 teaches that:

"The Model Library is important for several reasons: it offers a quick way to learn the facilities of FEMLAB and you can examine the results of completed models. You can also save time by using models from the Model Library as an initial platform for developing your own models. You can modify the geometry, the values of variables, boundary conditions, etc."

The figure on p.1-50 also demonstrates this."

68. In regards to the limitations of claim 87, FEMLAB 1.0 product documentation teaches the following limitations:

87. The method of Claim 86, further comprising:
using overloading in connection with at least one method to disable functionality of said at least one method.
(FEMLAB User's Guide, for example: pp.1-49 to 1-52)

For example, the last paragraph of p.1-50 teaches that:

"The Model Library is important for several reasons: it offers a quick way to learn the facilities of FEMLAB and you can examine the results of completed models. You can also save time by using models from the Model Library as an initial platform for developing your own models. You can modify the geometry, the values of variables, boundary conditions, etc."

The figure on p.1-50 also demonstrates this."

69. In regards to the limitations of claim 88, FEMLAB 1.0 product documentation teaches the following limitations:

88. The method of Claim 87, further comprising:
selecting a plurality of application modes associated with a plurality of systems, said user-defined application being one of said plurality of application modes selected; and
(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

forming a combined system of partial differential equations using partial differential equation systems associated with said plurality of application modes.

(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, p.1-57 teaches that "In PDE mode, you can interactively specify application-dependent material parameters in the Physics mode or the PDE coefficients in the PDE modes. You can specify the values for each subdomain independently. This makes it easy to specify, e.g., various material properties in a FEMLAB model."

70. In regards to the limitations of claim 89, FEMLAB 1.0 product documentation teaches the following limitations:

89. The method of Claim 82, further comprising:
defining at least one user-defined application that is a subclass of an existing class associated with an application mode.

(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, pp.1-6 and 1-7 teach that "When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the 'New' tab and choose the application mode that you want to work in. To load a completed model you click on the 'Model Library' tab and choose a model from one of the application areas."

The figure on p.1-6 also shows that 'Stationary' and 'Time Dependent' subclasses of an existing class, 'Nonlinear'. Also, the figure shows that 'Nonlinear' and 'Linear' are subclasses of Diffusion. In addition, the '+' sign next to 'PDE Modes' shows that it too has subclasses.

71. In regards to the limitations of claim 90, FEMLAB 1.0 product documentation teaches the following limitations:

90. The method of Claim 89, wherein said application mode associated with said existing class is user-defined.

(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, pp.1-6 and 1-7 teach that "When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the 'New' tab and choose the application mode that you want to work in. To load a completed model you click on the 'Model Library' tab and choose a model from one of the application areas."

The figure on p.1-6 also shows that 'Stationary' and 'Time Dependent' subclasses of an existing class, 'Nonlinear'. Also, the figure shows that

'Nonlinear' and 'Linear' are subclasses of Diffusion. In addition, the '+' sign next to 'PDE Modes' shows that it too has subclasses.

72. In regards to the limitations of claim 91, FEMLAB 1.0 product documentation

teaches the following limitations:

91. The method of Claim 89, wherein said application mode associated with said existing class is predefined.

(FEMLAB User's Guide, for example: pp.1-6, 1-7, 1-10, 1-57, 1-117)

For example, pp.1-6 and 1-7 teach that "When you start FEMLAB, you invoke the Model Navigator. ... To start creating a new model you click on the 'New' tab and choose the application mode that you want to work in. To load a completed model you click on the 'Model Library' tab and choose a model from one of the application areas."

The figure on p.1-6 also shows that 'Stationary' and 'Time Dependent' are predefined subclasses of an existing class, 'Nonlinear'. Also, the figure shows that 'Nonlinear' and 'Linear' are predefined subclasses of Diffusion. In addition, the '+' sign next to 'PDE Modes' shows that it too has predefined subclasses.

73. Claims 92-101 are rejected based on the same reasoning as claims 82-91,

supra. Claims 92-101 are computer program product claims reciting the equivalent limitations as are recited in method claims 82-91 and taught throughout FEMLAB 1.0 product documentation.

Claim Rejections - 35 USC § 103

74. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

75. The prior art used for these rejections is as follows:

76. FEMLAB 1.0 Reference Manual. First Printing, July 1998. (Henceforth referred to as **"FEMLAB Reference Manual"**).

77. FEMLAB 1.0 User's Guide and Introduction. First Printing, July 1998. (Henceforth referred to as **"FEMLAB User's Manual"**).

78. FEMLAB 1.0 Model Library. First Printing, July 1998. (Henceforth referred to as **"FEMLAB Model Library"**).

79. FEMLAB 1.0 Structural Mechanics Engineering Module. First Printing, July 1998. (Henceforth referred to as **"FEMLAB Structural Mechanics Module"**).

80. Partial Differential Equation Toolbox User's Guide: For Use with MATLAB. © 1984-1997. p.1-8. (Henceforth referred to as **"PDE Toolbox"**).

81. Wilks, Mike. "Primer on Object-Oriented Programming". 1996. (Henceforth referred to as **"Object Oriented Programming"**).

82. The four cited documents constituted the official documentation set that was shipped with the FEMLAB 1.0 product. The Preface of the FEMLAB User's Manual (p.1-2) states that:

The documentation bundle in the FEMLAB package consists of the following volumes:

- User's Guide and Introduction (this volume)
- Reference Manual
- Model Library

And the optional add-on module is delivered with this volume:

- Structural Mechanics Engineering Module

Moreover, the top three volumes share the same index. All pages with a 1- prefix (e.g. p.1-1, p.1-29) are in the User's Guide. All pages with a 2- prefix (e.g. p.2-1, p.2-29) are in the Model Library. All pages with a 3-, 4-, or 5- prefix (e.g. p.3-1, p.4-29) are in the Reference Manual.

The Examiner is therefore treating the first three references as three volumes of the same document, which Examiner is calling "FEMLAB 1.0 product documentation."

83. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

84. Claims 34 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over FEMLAB 1.0 product documentation in view of PDE Toolbox.

85. In regards to the limitations of claim 34, FEMLAB 1.0 product documentation does not expressly teach the following limitations:

34. The method of Claim 1, wherein one of said plurality of systems being modeled is a three-dimensional geometry model.

In fact, FEMLAB User's Manual (p.1-2) teaches that:

The natural continuation of the current stage of development is the emergence of the modules and enhancements that address the fields of Fluid Dynamics and Electromagnetics. A significant milestone in the development work will be the emergence of 3D modeling capabilities, which will have a considerable impact on the power of the package.

PDE Toolbox, on the other hand, teaches in p.1-8 how to solve 3-D problems by 2-D models.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of FEMLAB 1.0 product

documentation with the teachings of PDE Toolbox, because both are applications that are used in conjunction with MATLAB.

86. Claim 74 is rejected based on the same reasoning as claim 34. Claim 74 is a computer program product claim reciting the equivalent limitations as are recited in method claim 34 and taught throughout FEMLAB 1.0 product documentation and PDE Toolbox.

87. Claims 37-38 and 77-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over FEMLAB 1.0 product documentation in view of “Object Oriented Programming”.

88. In regards to the limitations of claim 37, FEMLAB 1.0 product documentation teaches the following limitations:

37. The method of Claim 36, further comprising:
overloading a second portion of methods to provide alternative functionality.
(FEMLAB Reference Manual, especially: p.3-16 to p.3-17)

FEMLAB Reference Manual teaches on p.3-16 a “hierarchical inheritance structure of the 2-D geometry classes”, and on p.3-17, a “hierarchical inheritance structure of the 1-D geometry classes.

However, FEMLAB Reference Manual does not teach the overloading of apporation of a method to provide an alternative functionality.

“Object Oriented Programming”, on the other hand, does teach this. Under the section titled “Polymorphism”, “Object Oriented Programming teaches the following:

Polymorphism is the ability of objects to react differently when presented with different information, known as parameters ... This ability of a method

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to react to different parameters is achieved by *overriding*, a number of methods are written (with the same name) but each one has a different set of input parameters.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of FEMLAB 1.0 product documentation with the teachings of "Object Oriented Programming", because the Geometry Objects taught in FEMLAB 1.0 product documentation are example of Object Oriented Programming.

89. In regards to the limitations of claim 38, FEMLAB 1.0 product documentation teaches the following limitations:

38. The method of Claim 37, further comprising: using overloading in connection with at least one method to disable functionality of said at least one method.
(FEMLAB Reference Manual, especially: p.3-16 to p.3-17)

FEMLAB Reference Manual teaches on p.3-16 a "hierarchical inheritance structure of the 2-D geometry classes", and on p.3-17, a "hierarchical inheritance structure of the 1-D geometry classes.

However, FEMLAB Reference Manual does not teach the overloading of apportion of a method to provide an alternative functionality.

"Object Oriented Programming", on the other hand, does teach this. Under the section titled "Polymorphism", "Object Oriented Programming teaches the following:

Polymorphism is the ability of objects to react differently when presented with different information, known as parameters ... This ability of a method to react to different parameters is achieved by *overriding*, a number of methods are written (with the same name) but each one has a different set of input parameters.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of FEMLAB 1.0 product documentation with the teachings of "Object Oriented Programming", because the Geometry Objects taught in FEMLAB 1.0 product documentation are example of Object Oriented Programming.

Response to Arguments

Claim Rejections - 35 USC § 112

90. In regards to the 35 USC § 112, first paragraph rejections of claims 17-20 and 57-60, the Applicants presented (see pp.18-19 of the amendment filed 11/28/05) a "simple example" of the transformation of converting a set of PDEs from coefficient form to general form. The applicants also state that "the general case is not more difficult to implement", and state that "the hypothetical example illustrates why Figs.9 and 11 and page 54, lines 4-19 in the above-identified patent application describes what is needed to convert from coefficient to general form to someone of ordinary skill in the art.
91. Examiner finds Applicants' "simple example" to be an example of what p.54 of the specification, lines 17-19, refers to as "symbolic manipulation of the mathematical expressions". Examiner therefore agrees that one skilled in the art would be able to implement the claimed invention based on the disclosure in the specification and the figures. The relevant rejections have been withdrawn.

Claim Rejections - 35 USC § 102

92. Applicants unpersuasively argue (see p.19 of the amendment filed on 11/28/2005) that:

Accordingly, the cited prior art only discloses selecting a single application mode that is transformed into a system of partial differential equations.

In sharp contrast, with the present invention a user can select a combination of two or more application modes, combine these, and derive a corresponding system of PDEs. The combination of two or more application modes typically represent different physics phenomena, such as heat transfer, structural mechanics, or fluid dynamics.

Examiner respectfully disagrees with Applicants' characterization of the teachings in the cited prior art. Applicants' attention is respectfully directed to other sections of FEMLAB User's Guide pages 1-6 and 1-8, which teach (emphasis added):

There are two sets of modes available on the New page: physics modes and PDE modes. ... Within the modes and modules of FEMLAB quite a number of physical phenomena in many engineering and scientific disciplines can be modeled, e.g.:

- Acoustics
- Chemical reactions

...

Some models involve more than one application, e.g., thermo-electrical effects. This kind of modeling is referred to as *multiphysics* modeling and is available by using the PDE models. ...

As already mentioned, the basic mathematical structure that FEMLAB is founded upon, is a system of *partial differential equations* (PDEs). **The PDEs can be represented in the *coefficient form* or the *general form*.**

... A more detailed description of the mathematical and numerical background can be found in "Overview of PDE models in FEMLAB" on page 1-85, and "Overview of FEM" on page 1-91, as well as in the *Reference Guide*.

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Examiner therefore finds that these teachings read directly upon the limitations of the amended independent claims 1, 42, 82 and 92.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a biweek, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached at (571) 272-3749.

Any response to this office action should be faxed to (571) 273-8300, or mailed to:

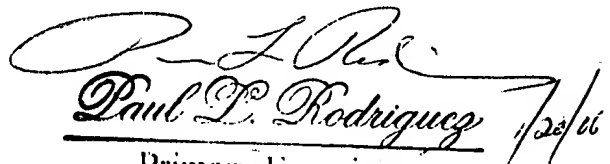
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or hand carried to:

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon
Art Unit 2123
January 19, 2006


Paul D. Rodriguez
Primary Examiner
Art Unit 2125